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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/772,986

Filing Date: January 31, 2001

Appellant(s): HAYASHI ET AL.

Ronald P. Kananen
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 02/27/2008 appealing from the Office action mailed 11/28/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

The Decision on Appeal for this application dated 28/06/2007 reversed the Examiner's 35 U.S.C. 102(b) rejection of claims 1-8, 13 and 15 but sustained the 35 U.S.C. 103(a) rejection of claims 14 and 16. The Decision on Appeal (page 8) made a new ground of rejection of claims 1-8, 13 and 15 under 35 USC 103(a) pursuant to 37 C.F.R. 41.50(b).

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,912,506	COLGAN et al.	06-1999
6,235,561	SEIKEI et al.	05-2001
JP 10-209467	HISAO et al.	08-1998

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 17-27 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisao et al. (JP 10-209467).

Hisao et al. discloses a thin film semiconductor device (Fig. 1) comprising: a gate electrode 5 in contact with an insulating substrate 1; a gate insulating film 4 in contact with a gate electrode, the gate electrode being between the insulating substrate and the gate insulating film. Hisao et al. further discloses the gate electrode 5 having an upper layer 5a of about 50-300 nm and a lower layer 5b of 50-200 nm (Hisao, paragraph [0012] and paragraph [0014]) that together provides a combined gate thickness of about 100-500 nm. The combined gate thickness with a lower limit range value of "about 100 nm" allows for values slightly below 100 nm. Hisao also discloses that the gate

insulating film 4 has a thickness in the range of 100-200 nm (Hisao, paragraph [0016]) which allows for a lower limit range value of 100 nm. As such, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to select the gate electrode 5 having a smallest combined gate thickness of slightly less than 100 nm and the gate insulating film 4 having a smallest thickness of 100 nm to reduce the size of the device. Furthermore, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. It is obvious that a selected thickness of the gate insulating film 4 of 100 nm is greater than a selected thickness of the gate electrode 5 of slightly below 100 nm as taught by Hisao. Also, it is noted that where claimed ranges overlap the ranges disclosed in the prior art, a *prima facie* case of obvious is established. See *Woodruff*, 919 F.2d at 1577, 16 USPQ2s at 1936, and *In re Wertheim*, 541 F.2d 257, 271, 191 USPQ 90, 103-04 (CCPA 1976).

Regarding claim 18, Hisao discloses a semiconductor thin film 2 in contact with the gate insulating film 4, the semiconductor thin film including a source region, a channel region, and a drain region.

Regarding claim 19, Hisao discloses a stopper 6 in contact with the channel region, the channel region being between the gate insulating film 4 and the stopper 6.

Regarding claim 20, the stopper is an insulator.

Regarding claim 21, the source and drain regions are adjacent said channel region.

Regarding claim 22, the gate electrode 5 includes a lower layer 5b and an upper layer 5a, the lower layer being between the insulating substrate and the upper layer.

Regarding claim 23, the lower layer 5b is in contact with the insulating substrate.

Regarding claim 24, the upper layer 5a is in contact with the lower layer.

Regarding claim 25, the gate insulating film 4 is between the upper layer 5a and the semiconductor thin film 2.

Regarding claim 26, an electric resistance of said upper layer 5a is greater than said lower layer 5b, heat conductivity of said lower layer being greater than said upper layer (see paragraph 0012).

Regarding claim 27, the lower layer is a metallic material and said upper layer is another metallic material.

Regarding claim 36, Hisao discloses a display device (Fig. 6) comprising: a plurality of pixels 14 arranged in a matrix form, one of the plurality of pixels being driven by the thin film semiconductor device 3.

Claims 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisao et al. (JP 10-209467) in view of Colgan et al. (US 5,912,506).

Hisao et al. as described above does not disclose the metallic material of the lower layer 5b contains aluminum and the upper layer 5a of molybdenum. However, aluminum and molybdenum are well known gate conductor materials as shown for example by Colgan. Colgan discloses a gate electrode comprising a lower layer 5 containing aluminum and an upper layer 7 of molybdenum (see Fig. 7). Therefore, forming the metallic material of the lower layer 5b containing aluminum and the upper

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layer of another metallic material, molybdenum (Mo) would have been obvious modification for the advantages that aluminum provides like high electrical conductivity and low cost; and the suppression of hillocks in the gate electrode due to the presence of the upper layer of molybdenum as taught by Colgan.

Regarding claims 29 and 30, Colgan discloses the metallic material being aluminum or an alloy of aluminum and silicon.

Regarding claims 31-32, the another metallic material is molybdenum

Claims 31-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisao et al. (JP 10-209467) in view of Seiki et al. (US 6,235,561).

Hisao et al. as described above does not disclose the metallic material of the lower layer 5b contains aluminum and the another metallic material of the upper layer 5a being formed of molybdenum, tantalum, tungsten or chromium. However, aluminum, molybdenum, tantalum, tungsten and chromium are well known gate conductor materials as shown for example by Seiki. Seiki discloses a gate electrode comprising a lower layer 111 containing aluminum and an upper layer 115 selected from the group consisting of chromium, tungsten, tantalum and molybdenum (see col. 1, lines 28-33; and col. 5, lines 49-52). Therefore, forming the metallic material of the lower layer 5b containing aluminum and the upper layer of another metallic material as claimed would have been obvious modification for the advantages that aluminum provides like high electrical conductivity and low cost; and the suppression of hillocks in the gate electrode due to the presence of the upper layer being selected from the group consisting of chromium, tungsten, tantalum, and molybdenum as taught by Seiki.

(10) Response to Argument

With respect to claim 17, Appellant states that claim 17 recites the thickness of the gate insulating film greater the thickness of the gate electrode, and Hisao fails to show a thickness of the gate insulating film 4 being greater than a thickness of the gate electrode 5. On page 6 and page 7 of the Brief, Appellant asserts that Hisao discloses an insulating film 4 having a thickness of 100-200 nm and a gate electrode 5 having an upper layer 5a of 50-200 nm and a lower layer 5b of 50-200 nm (Hisao, paragraph [0012]). Thus, on page 8 of the Brief, Appellant argues that the Final Office action merely argues and fails to identify any written description in the specification of Hisao that teaches a thickness of the gate insulating film 4 greater than a thickness of the gate electrode 5. The Examiner respectfully disagrees with the remark because Appellant erred when stating Hisao discloses a gate electrode 5 having an upper layer 5a of 50-200 nm as described in paragraph [0012]. In fact, paragraphs [0012] and [0014] clearly disclose the top gate layer 5a having a thickness of about 50-300 nm. The top gate's thickness together with a lower gate's thickness 5b of 50-200 nm provide a gate electrode 5 having a combined thickness of about 100-500 nm. As clearly explained in the Final office action, the selection of the gate electrode 5 having a smallest combined gate thickness of slightly less than 100 nm and the gate insulating film 4 having a smallest thickness of 100 nm to make the device as small as possible would read on the claimed structure. It is noted that in the Decision on Appeal dated 28/06/2007, the Board of Patent Appeals and Interferences (BPAI) agrees with the examiner's position that Hisao teaches a gate thickness of "about 100 nm". The Board then confirms the

language "about 100 nm" allows for values slightly below 100 nm; therefore, it would have been *prima facie* obvious to form the gate insulating film having a thickness greater than a thickness of the gate electrode (see pages 8-9 of the Decision on Appeals dated June 28, 2007).

On page 7 of the Brief, Appellant also argues that drawings in the Hisao are not drawn to scale so "arguments based on the measurement of a drawing are of little value absent any written description of the quantitative values allegedly shown within the drawings". The Examiner respectfully disagrees with the remark because the written description in Hisao (paragraphs [0012], [0014], and [0016]) discloses the thicknesses of the gate electrode (about 100 nm that allows for slightly less than 100 nm) and the gate insulating film (100 nm), and the drawing (Fig. 1) shows a gate insulating film 4 having a thickness greater than a thickness of the gate electrode 5. Thus , the specification clearly provides dimensions (a quantitative values) shown within the drawings. It is urged that the drawing clearly shows the structure which is claimed and should be relied on to show the sizes of the gate electrode and the gate insulating film. It is held that the drawings must be evaluated for what they reasonably disclose and suggest to one of ordinary skill in the art. *In re Aslanian*, 590 F.2d 911, 200 USPQ 500 (CCPA 1979).

In response to Appellant's argument that the examiner is applying an improper "obvious to try" rationale in support of an obvious rejection (pages 8-10 of the Brief). Again, an "obvious to try" rationale may support a conclusion that a claim would have been obvious where one skilled in the art is choosing from a finite number of identified,

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predictable solutions, with a reasonably expectation of success. "A person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely that product was not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under 103." KSR International co. v. Teleflex inc., 550 U.S., 82 USPQ2d 1385, 1397 (2207). Indeed, a person of ordinary skill in the art would have selected the smallest values for the gate insulating film and the gate electrode disclosed by Hisao in order to obtain a device as small as possible.

Appellant further argues that "the prior art gives no indication of which parameters are critical or no direction as to which of many possible choices is likely to be successful" so "Hisao does not contain a sufficient teaching of how to obtain the desired result or the claimed result would be obtained if certain directions were pursued. The variation in gate electrode thickness alone would not preclude one of ordinary skill in the art from selecting the smallest dimension for the gate electrode if size is matter. Also, it has been held that the mere fact that Hisao fails to evince an appreciation of the problem identified and solved by Appellant is not, standing alone, conclusive evidence of the nonobviousness of the claimed subject matter. The reference may suggest doing what Appellant has done even though workers in the art were ignorant of the existence of the problem. In re Gershon, 152 USPQ 602 (CCPA 1967). Furthermore, it not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by Appellant. In re Linter, 458 F.2d 1013, 173 USPQ 560 (CCPA

1972); *in re Dillon*, 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1990), cert. Denied, 500 U.S. 904 (1991).

On page 9 of the Brief, Appellant states that the teachings or suggestions or technical facts supporting the obvious type rejection must always be supported by citation, and the Final Office action failed to explain the "common knowledge and common sense" on which it relied. The Examiner respectfully disagrees with the remark because Hisao clearly provides dimensions (values) as technical facts for the gate insulating film 4 and the gate electrode 5. Also, it would have been obvious to one having ordinary skill in the art to apply the teachings in Hisao using any appropriate techniques known in the art since not only the specific teachings of a reference but also reasonable inferences which the artisan would have logically drawn therefrom may be properly evaluated in formulating a rejection. *In re Preda*, 401 F.2d 825, 159 USPQ 342 (CCPA 1968) and *In re Shepard*, 319 F.2d 194, 138 USPQ 148 (CCPA 1963). Skill in the art is presumed. *In re Sovish*, 769 F.2d 738, 226 USPQ 771 (fed. Cir. 1985). Furthermore, artisans must be presumed to know something about the art apart from what the references disclose. *In re Jacoby*, 309 F.2d 513, 135 USPQ 317 (CCPA 1962). The conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference. *In re Bozek*, 416 F.2d 1385, 163 USPQ 545 (CCPA 1969). Every reference relies to some extent on knowledge of persons skilled in the art to complement that which is disclosed therein. *In re Bode*, 550 F.2d 656, 193 USPQ 12 (CCPA 1977). Indeed, it would make sense for one of ordinary skill in the art to form

the device as small as possible by selecting the smallest dimensions (values) disclosed by Hisao for the gate electrode thickness as well as for the gate insulating film thickness to reduce the amount of materials that would have used for the gate electrode and the gate insulating film. As a result, the manufacturing cost could be reduced.

On pages 10-12 of the Brief, Appellant argues that the claimed invention provides unexpected results and "the Final Office action fails to show unexpectedly superior results within Hisao produced by the thickness of the gate insulating film 4 being greater than the thickness of the gate electrode 5a, 5b". The Examiner disagrees with the remark because Appellant merely argues without providing comparative data in the specification showing the criticality of the claimed gate thickness. Figures 3 and 4 show graphs with no unexpected peak or jump near 100 nm. It is noted that in page 8 of the Decision on Appeal dated 28/06/2007, the Board of Patent Appeals and Interferences (BPAI) found no evidence of criticality of the claimed gate thickness value below 100 nm. As a result, the Examiner's *prima facie* case of obviousness has not been overcome and the 35 U.S.C. 103(a) rejection is sustained. In addition, Hisao discloses the device similar to the claimed structure having the selected thicknesses for the gate electrode and the gate insulating film as claimed. It would have been obvious that the structure of Hisao is capable of providing the same advantage or result discovered by Appellant.

On pages 12-13, Appellant argues that Colgan does not teach a thickness of the gate insulating film being greater than a thickness of the gate electrode. In response to Appellant's arguments against the references individually, one cannot show

nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

On page 13, Appellant argues that Seiki does not teach a thickness of the gate insulating film being greater than a thickness of the gate electrode. In response to Appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer are in the record.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Thien F Tran/

Primary Examiner, Art Unit 2811

Conferees:

David Blum/David S Blum/

TQAS Appeal Specialist, TC 2800

Lynne Gurley /L. A. G./

Supervisory Patent Examiner, Art Unit 2811

Thien Tran